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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor	:	Zine-Eddine Boutaghou et al.	
Appln. No.	:	09/553,220	
Filed	:	April 20, 2000	Group Art Unit: 2651
Title	:	BENDING MICROACTUATOR HAVING A TWO-PIECE SUSPENSION DESIGN	Examiner: Angel A. Castro
Docket No.	:	I69.12-0433	

RESPONSE

Box Non-Fee Amendment
Assistant Commissioner for Patents
Washington, D.C. 20231

SENT VIA EXPRESS MAIL

Express Mail No. EL763826661US

Sir:

This is in response to the Office Action mailed on February 27, 2002 in which claims 1-6 and 12-15 were rejected and claims 7-11 and 16-17 were objected to. Specifically, claims 2-6 and 13 were rejected under 35 U.S.C. § 102(e) as being anticipated by Kant et al. (U.S. Patent No. 6,297,936), claims 1-3 and 6 were rejected under 35 U.S.C. § 102(e) as being anticipated by Hawwa et al. (U.S. Patent No. 6,108,175), claim 12 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Kant et al. in view of Fan et al. (U.S. Patent No. 5,364,742) and claims 14-15 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kant et al.

The present application recites an actuation system including an actuator arm, a suspension, a flexure, and a slider (as shown in FIG. 1 below). The present invention is a microactuation system for use in a dual-stage disc drive actuation system for high resolution positioning of a transducing head. The microactuation system is comprised of a bending motor and a load beam (shown in FIG. 3 below), which are all components of the suspension. In some embodiments, the bending motor is mounted to a top surface of a flexible beam.

Claim 2 of the present application recites a microactuator for selectively altering a position of a transducing head carried by a slider in a disc drive system with respect to a track of a rotatable disc having a plurality of concentric tracks. The disc drive system has an actuator arm. The

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microactuator comprises a load beam attached to a distal end of the actuator arm, the load beam having a first section. A flexure for supporting the slider carries the transducing head. A bending motor is attached between the first section of the load beam and the flexure, the bending motor being deformable in response to a control signal applied thereto.

Claim 13 of the present application recites a disc drive suspension. The disc drive suspension includes an actuator arm having a proximal end and a distal end. A load beam is attached to the distal end of the actuator arm. The load beam has a mounting region at a proximal end, a head suspension near a distal end of the load beam, and a flexible region between the mounting region and the head suspension. A flexure is configured to support a transducing head. A beam is connected between the head suspension and the flexure. A bending motor is attached to a top surface of the beam such that the beam supports the bending motor and transforms a force on the flexure into a compressive load on the bending motor, the bending motor being deformable in response to a control signal applied thereto.

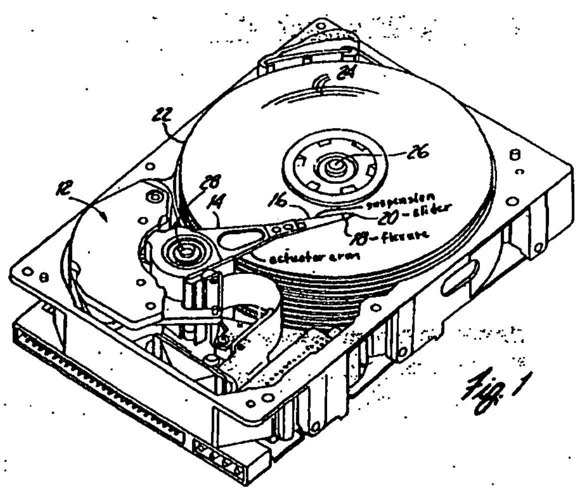

Fig. 1

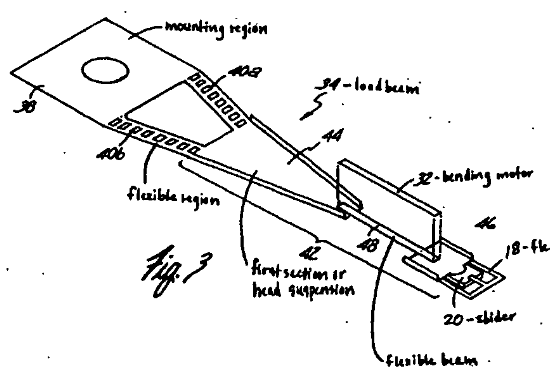

Fig. 3

The following is an overview of the cited prior art, which will be discussed further in our response. Kant et al. discloses a disc drive including a microactuator to finely position a transducing head adjacent to a selected track of a rotatable disc, as seen by FIGS. 2, 4 and 5 below. The disc drive includes an actuator arm, a load beam attached to the actuator arm, a flexure attached

to a deflectable portion of the load beam and a slider supported by the flexure proximate the surface of the rotatable disc. The slider carries the transducing head for transducing data with the disc. The disc drive includes an actuator for coarsely positioning the actuator arm, load beam, flexure, and slider carrying the transducing head adjacent to a selected track of the rotatable disc. The disc drive also includes a microactuator integrally formed in the load beam, the microactuator being operable to deflect the deflectable portion of the load beam to finely position the flexure and the slider carrying the transducing head adjacent to the selective track of the rotatable disc.

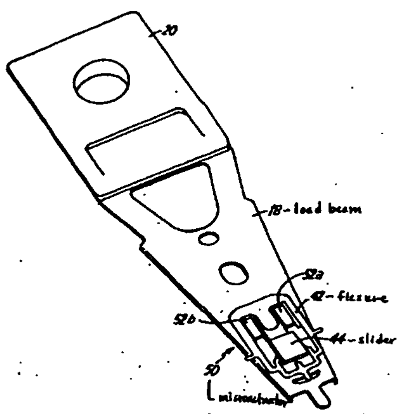

FIG. 2

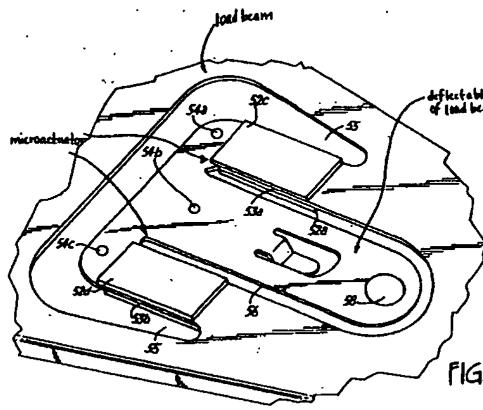

FIG. 4

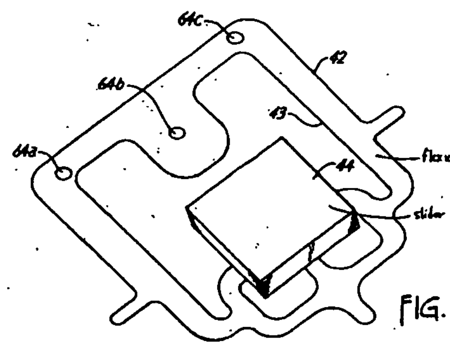

FIG. 5

Hawwa et al. discloses a head flexure assembly for radially positioning a transducing head over a selected track of a rotatable disc in a disc drive system having an actuator arm and head suspension. The head flexure assembly is comprised of a bimorph piezoelectric microactuator having first and second ends, the microactuator being bendable in response to a control signal in a plane generally parallel to the rotatable disc. Specifically, Hawwa et al. teaches a head flexure assembly

wherein the microactuator is attached between the actuator arm and the flexure for moving the flexure with respect to the actuator arm. Attachment means attach the first end of the microactuator to the actuator arm and flexure is attached to the second end of the microactuator (as seen in FIG. 2 below). A slider is attached to the flexure, the slider carrying the transducing head. The attachment means is preferably a swage plate attached to a distal end of the actuator arm, the swage plate having flaps swaged to clamp the first end of the microactuator.

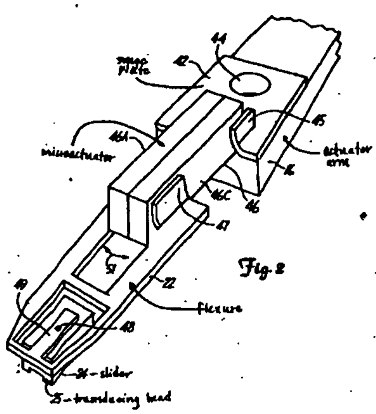

Fig. 2

Claim rejections-35 U.S.C. § 102(e)

Claims 2-6 and 13 were rejected under §102(e) as being anticipated by Kant et al.

Claim 2 of the present invention recites a microactuator for selectively altering a position of a transducing head carried by a slider in a disc drive system with respect to a track of a rotatable disc having a plurality of concentric tracks. The disc drive system has an actuator arm. The microactuator comprises a load beam attached to a distal end of the actuator arm, the load beam having a first section. A flexure for supporting the slider carries the transducing head. A bending motor is attached between the first section of the load beam and the flexure, the bending motor being deformable in response to a control signal applied thereto.

Kant et al. does not disclose, teach or suggest the structure recited in claim 2. As discussed and shown above in FIGS. 2, 4 and 5 of Kant et al., the microactuator of Kant et al. is integrally formed in the load beam. The flexure is attached by mounting points 54a, 54b, and 54c to a deflectable portion of the load beam at points 64a, 64b and 64c. The microactuator of Kant et al.

is formed as part of the load beam and operable to deflect the deflectable portion of the load beam to finely position the flexure. Claim 2 of the present application recites a bending motor attached between a first section of the load beam and the flexure. The bending motor is deformable in response to a control signal applied thereto to move the flexure supporting the slider carrying the transducing head with respect to tracks of a rotatable disc. The flexure is not attached to a deflectable portion of a load beam, and more importantly the load beam itself is not deflectable. In the microactuator disclosed in claim 2, the flexure is not attached directly to the load beam.

The microactuator disclosed in Kant et al. does not teach, suggest or disclose the bending motor of claim 2. The bending motor recited in claim 2 is not integrally formed in the load beam, but rather has one end attached to the load beam and one end attached to the flexure. The microactuator of Kant et al. is comprised of two outer panels formed in the load beam, and each outer panel is sandwiched between piezoelectric elements on the top side and bottom side of the panel. The microactuator includes attachment joints formed in the load beam where the flexure is attached to the microactuator, or deflectable portion of the load beam. The bending motor recited in claim 2 of the present application is not integrally formed in the load beam, but is attached to a non-deflectable load beam and the flexure individually (as seen in FIG. 3 of the present application).

Kant et al. does not yield the present invention as defined by claim 2, thus the rejection of claim 2 under 35 U.S.C. § 102(e) should be withdrawn. Claims 3-6 depend from claim 2 therefore the rejection of claims 3-6 should be withdrawn as well.

Claim 13 of the present application recites a disc drive suspension. The disc drive suspension includes an actuator arm having a proximal end and a distal end. A load beam is attached to the distal end of the actuator arm. The load beam has a mounting region at a proximal end, a head suspension near a distal end of the load beam, and a flexible region between the mounting region and the head suspension. A flexure is configured to support a transducing head. A beam is connected between the head suspension and the flexure. A bending motor is attached to a top surface of the beam such that the beam supports the bending motor and transforms a force on the flexure into a

compressive load on the bending motor, the bending motor being deformable in response to a control signal applied thereto.

Kant et al. does not disclose, teach or suggest the structure recited in claim 13. As discussed above with respect to claim 2 and shown in FIG. 4 of the Kant et al. patent, the microactuator of Kant et al. is integrally formed in the load beam and the flexure is attached to a deflectable portion of the load beam (which forms part of the microactuator). Kant et al. does not disclose a beam connected between the head suspension of the load beam and the flexure. In addition, the microactuator of Kant et al. is not attached to a top surface of a beam extending between the head suspension and the flexure. Accordingly, the rejection of claim 13 under 35 U.S.C. § 102(e) should be withdrawn.

Claims 1-3 and 6 were rejected under 35 U.S.C. § 102(e) as being anticipated by Hawwa et al. In regards to claim 1, it is respectfully submitted that Hawwa et al. does not disclose the invention as claimed. Claim 1 recites a microactuator for selectively altering a position of a transducing head carried by a slider in a disc drive system with respect to a track of the rotatable disc having a plurality of concentric tracks. The disc drive system has an actuator arm attached to a load beam for supporting the slider over the rotatable disc and the load beam has a stationary region and a moving region. The microactuator comprises means for flexibly coupling the stationary region of the load beam to the moving region of the load beam and means for selectively altering a position of the slider with respect to the rotatable disc. The means for selectively altering extend from the distal end of the stationary region to a proximal end of a moving region generally along a longitudinal center line of the stationary region.

Claim 1 contains two elements, both of which are set forth in means-plus-function form, as prescribed by 35 U.S.C. § 112, paragraph 6. Thus, the two elements must be interpreted as limited to the corresponding structure described in the specification and equivalence thereof. See MPEP 2181, citing *In re Donaldson Company*, 29 U.S.P.Q.2d (BNA) 1845 (Fed. Cir. 1994). The first element of claim 1 recites "means for flexibly coupling the stationary region of the load beam to the moving region of the load beam." The corresponding structure for this means is defined in the

specification and drawings of the present application as a flexible beam, which connects the stationary region of the load beam to the moving region of the load beam.

The second element of claim 1 recites "means for selectively altering a position of the slider with respect to the rotatable disc, the means extending from the distal end of the stationary region to a proximal end of the moving region generally along a longitudinal centerline of the stationary region." The corresponding structure for the means for selectively altering is defined in the specification and drawings of the present application as a bending motor mounted to the flexible beam. The flexible beam is the structural element which connects the stationary region of the load beam to the moving region of the load beam, whereas the bending motor is the actuating element which extends from the stationary region to the moving region generally along a longitudinal center line of the stationary region. The bending motor operates as a bendable cantilever to alter the position of the moving region with respect to the stationary region and effect high resolution positioning of the transducing head.

The first and second elements of claim 1 (means for flexibly coupling and means for selectively altering) are set forth in means-plus-function language, thus corresponding structure disclosed in the specification for flexibly coupling and selectively altering (as described above), as well as structural equivalents thereof, must be considered in construing the scope of the claim elements. See MPEP 2181. In order for a prior art reference to anticipate claim 1, the reference must teach elements that perform the identical functions specified in the claim. In addition, the structure of the prior art elements must be the same as or equivalent to the structure described in the specification which correspond to the claimed means-plus-function. See MPEP 2182. Therefore, in order to anticipate claim 1, Kant et al. must disclose a structure which is the same as or equivalent to the present invention.

One of the factors to be considered in deciding structural equivalence is whether the prior art element performs the function specified in the claim in substantially the same way, and produces substantially the same results as the corresponding element disclosed in the specification. See MPEP 2184, citing *Lockheed Aircraft Corp. v. United States*, 193 U.S.P.Q. (BNA) 461 (Ct. Cl.

1977). Another factor to be considered is whether the differences between prior art elements and the structure disclosed in the specification are substantial. See MPEP 2184, citing *Warner-Jenkinson Co. v. Hilton Chemical Co.*, 41 U.S.P.Q.2d (BNA) 1865, 1875 (1997) and *Valmont Industries, Inc v. Reinke Mfg. Co.*, 25 U.S.P.Q.2d (BNA) 1451 (Fed. Cir. 1993).

A comparison of the teachings of Hawwa et al. to the structure disclosed in the present application reveals differences between the microactuator of the present application and the head flexure assembly of Hawwa et al. and precludes a finding that the two systems are interchangeable or equivalent. As discussed above and shown in FIG. 2 of Hawwa et al., Hawwa et al. teaches a head flexure assembly wherein the microactuator is attached between the actuator arm and the flexure for moving the flexure with respect to the actuator arm. The head flexure assembly of Hawwa et al. does not include a bending motor, or microactuator, attached to a flexible beam nor does the head flexure assembly or the disc drive system include a load beam. Hawwa et al. does not disclose or teach a microactuator or bending motor that moves a moving region of a load beam with respect to a stationary region of the load beam (as recited by claim 1 of the present application). The microactuator of Hawwa et al. shown in FIGS. 2-5 extends between an actuator and a flexure, not between a moving region and a stationary region of a load beam, as required by claim 1 of the present application. On the contrary, the head flexure assembly of Hawwa et al. does not include a load beam. Hawwa et al. discusses a prior art disc drive system including a load beam, however the invention of Hawwa et al. replaces the prior art load beam with a microactuator.

In order for a prior art element to be equivalent to means-plus-function limitation, the prior art element must perform the identical function specified in claim 1 in substantially the same way and produce substantially the same result as the means-plus-function limitation in claim 1. *Kemco Sales Inc. v. Control Papers Co., Inc.*, 208 F.3d 1352, 54 U.S.P.Q.2d 1308 (Fed. Cir. 2000). Hawwa et al. does not perform the stated function of the first or second elements of claim 1, flexibly coupling the stationary region of the load beam to the moving region of the load beam and selectively altering a position of the slider with respect to the rotatable disc (the means extending from a distal end of the stationary region to a proximal end of the moving region generally along a longitudinal centerline of

the stationary region). Hawwa et al. does not perform the claimed function of the first element. While the configuration in Hawwa et al. does perform the claimed function of the second element (selectively altering) of claim 1, the device does not perform this function in substantially the same way or produce substantially the same results as the device disclosed in claim 1 of the present application. As a result there can be no structural equivalence. See MPEP 2184, citing *In re Bond* 15 U.S.P.Q.2d 1566 Fed. Cir. 1990. Therefore, Hawwa et al. does not anticipate claim 1 and the rejection of claim 1 under 35 U.S.C. § 102(e) should accordingly be withdrawn.

Hawwa et al. does not disclose, teach or suggest the claimed invention disclosed in claim 2 of the present application. As discussed above, claim 2 recites a microactuator comprising a load beam attached to a distal end of the actuator arm and having a first section, a flexure for supporting the slider carrying the transducing head, and a bending motor attached between the first section of the load beam and the flexure, the bending motor being deformable in response to a control signal applied thereto.

Hawwa et al. does not disclose a load beam attached to the actuator arm with a microactuator connected between the load beam and the flexure. Rather, Hawwa et al. teaches a head flexure assembly, not including a load beam, where the microactuator is connected between the actuator arm and a flexure (seen in FIG. 2 of Hawwa et al. above). The Examiner misstates Hawwa et al. by saying that the microactuator is comprised of a load beam attached to a distal end of the actuator arm. There is no load beam disclosed in Hawwa et al.

A comparison of the prior art disc actuation system shown in FIG. 1 of Hawwa et al. and the inventive system shown in FIG. 2 of Hawwa et al. shows that the microactuator replaces the head suspension 18, or load beam, known in the prior art. In the present invention disclosed by claim 2, a microactuator is added to the disc drive actuation system between the load beam and the flexure to move the flexure with respect to the load beam, rather than the load beam being replaced by a microactuator (as in Hawwa et al.). Thus, Hawwa et al. does not disclose, teach or suggest adding a bending motor between the load beam and the flexure but rather eliminating the load beam

altogether and including a microactuator between the actuator arm and the flexure rather than a load beam.

Hawwa et al. does not yield the present invention as defined by claim 2, thus the rejection of claim 2 under 35 U.S.C. § 102(e) should be withdrawn. Claim 3 depends from claim 2, therefore the rejection of claim 3.

Claim rejection-35 U.S.C. § 103(a)

Claims 12 and 14-16 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kant et al., with claim 12 being unpatentable over Kant et al. in view of Fan et al. Claim 12 depends from claim 2 and is allowable therewith. Claims 14-15 depend from claim 13 and are allowable therewith. The rejection of claims 12 and 14-15 under 35 U.S.C. § 103(a) should accordingly be withdrawn. Furthermore, Kant et al. is assigned to Seagate Technology LLC, the same assignee as the present application. Since the present application was filed after November 29, 1999, the rejection is under 35 U.S.C. § 102(e)/103, and the inventions are commonly owned by Seagate Technology LLC, the rejection under 35 U.S.C. § 103(a) should be precluded. See MPEP 715.01(b).

Since the rejection of claims 2 and 13 should be withdrawn, claims 7-11 and 16-17 are no longer dependent upon rejected base claims and the objection to those claims should accordingly be withdrawn. Allowance of claims 1-17 is respectfully requested.

Respectfully submitted,

KINNEY & LANGE, P.A.

Date: 5/16/02

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